

Magnetic Bearings for Small Satellite CMG's and Other Miniature Spacecraft Mechanisms, Phase I

Completed Technology Project (2011 - 2011)



Project Introduction

NASA sees an increasing role in the near future for small satellites in the 5-100 kg size range. A potentially disruptive technology, small satellites, which are low cost and can be delivered in months, are being eyed as platforms for rapid demonstration of new technologies and even important science missions. From NASA's recently launched PharmaSat sub-10 kg free-flying nanosatellite, which has just successfully completed an experiment that could help scientists better understand how effectively drugs work in space, to potential future missions like CRESPO, a ~100 kg microsatellite that will use a hyperspectral imager to monitor the condition of more than 50% of the Earth's coral reefs over a 2-year period, NASA is counting on these small satellites to deliver. A miniature PMB technology is widely applicable to small mechanisms and will allow for a greater technological payoff with the next generation of small satellite missions. Honeybee Robotics is developing a small, modular control moment gyroscope (CMG) technology for use on small satellites. The life limiting and power driving aspect of this technology as with any CMG or reaction wheel (RW), are the rotor bearings which operate at 12,000 rpm. Honeybee Robotics proposes to develop a miniature passive magnetic bearing (PMB) for small satellite ACS components such as CMGs and RWs. This cross-cutting technology can also be applied to any small mechanism that might benefit from low parasitic torque, low induced vibration (IV), and long life. PMB technology for small satellites will allow for a step increase in life for their ACS subsystems. Enabling a small satellite mission lifetime of 15+ years rather than 1-3 years is a game-changing development that will alter the way mission planners think about small satellite capabilities. Prototype units will be integrated with our Tiny Operationally Responsive CMG (TORC) technology to demonstrate the relative merits compared to traditional ball bearings.



Magnetic Bearings for Small Satellite CMG's and Other Miniature Spacecraft Mechanisms, Phase I

Table of Contents

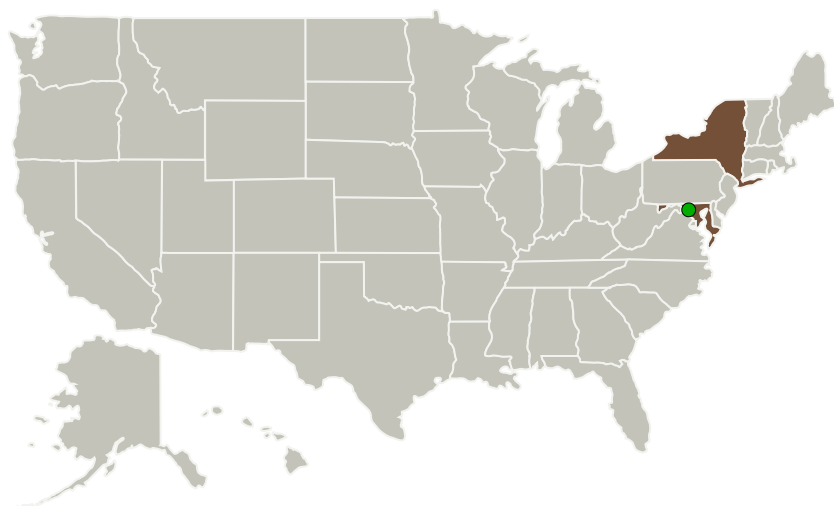
Project Introduction	1
Primary U.S. Work Locations and Key Partners	2
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

Magnetic Bearings for Small Satellite CMG's and Other Miniature Spacecraft Mechanisms, Phase I

Completed Technology Project (2011 - 2011)



Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Honeybee Robotics, Ltd.	Lead Organization	Industry	Pasadena, California
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations

Maryland	New York
----------	----------

Project Transitions

▶ **February 2011:** Project Start

✓ **September 2011:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138285>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Honeybee Robotics, Ltd.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

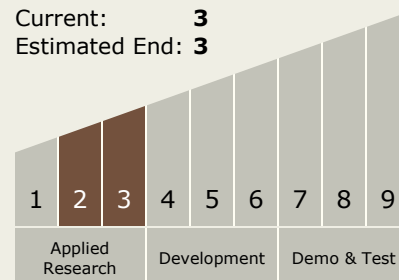
Carlos Torrez

Principal Investigator:

Kiel R Davis

Technology Maturity (TRL)

Start: 2
Current: 3
Estimated End: 3



Magnetic Bearings for Small Satellite CMG's and Other Miniature Spacecraft Mechanisms, Phase I

Completed Technology Project (2011 - 2011)



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System